Advanced Technology Cloud Particle Probe for UAS, Phase I

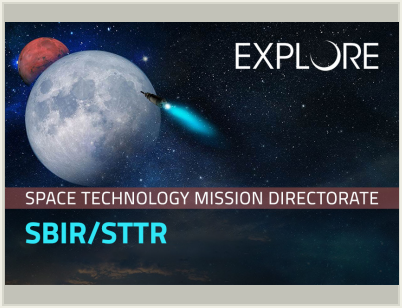
Completed Technology Project (2009 - 2009)

Project Introduction

NASA has initiated a program to explore the upper troposphere/lower stratosphere (UT/LS) using the Global Hawk Unmanned Aerial System (UAS), which has a payload of over 1500 lb (680 kg), max ceiling of 65,000 ft (20 km) at a cruising speed of 335 kts and mission endurance of over 31 hours. These attributes make the Global Hawk UAS especially valuable as a tool for investigating subvisible cirrus (SVC) clouds, which are commonly found in the Tropical Tropospheric Layer (TTL) and are considered to have a significant potential impact on global climate change. The first of a series of NASA field programs, the UAS Aura Validation Experiment (UAS-AVE), is scheduled to take place in 2009 with the Global Hawk investigating aerosols and gas phase chemistry in the UT/LS. In ensuing years it is anticipated that follow-on field projects will utilize the Global Hawk to investigate properties of SVC clouds. Currently, there is no instrument available for installation on the Global Hawk that is capable of measuring particle size distributions and capturing high-resolution images of cloud particles in SVC. These measurements are essential for understanding the radiative effects that SVC has on the earth energy balance. In Phase I we propose to design and perform proof-of-concept laboratory tests of a state-of-the-art integrated instrument that measures cloud particle size distributions from 1 micron to about 3 mm, and provides three simultaneous digital images of cloud particles. The new probe will combine three instruments that SPEC sells commercially into a compact, aerodynamic package that runs autonomously. In addition, it will be totally compatible with the NASA Research Environment for Vehicle-Embedded Analysis on Linux (REVEAL) system, so that investigators on the ground can view data and control probe functions. In Phase II we propose to build a working prototype and fly it on the Global Hawk (or a Learjet research aircraft if the Global Hawk is not available).

Anticipated Benefits

Potential NASA Commercial Applications: The new integrated cloud particle probe will replace existing technology and be installed on aircraft for research applications, cloud seeding, airframe icing certification and in icing wind tunnels.



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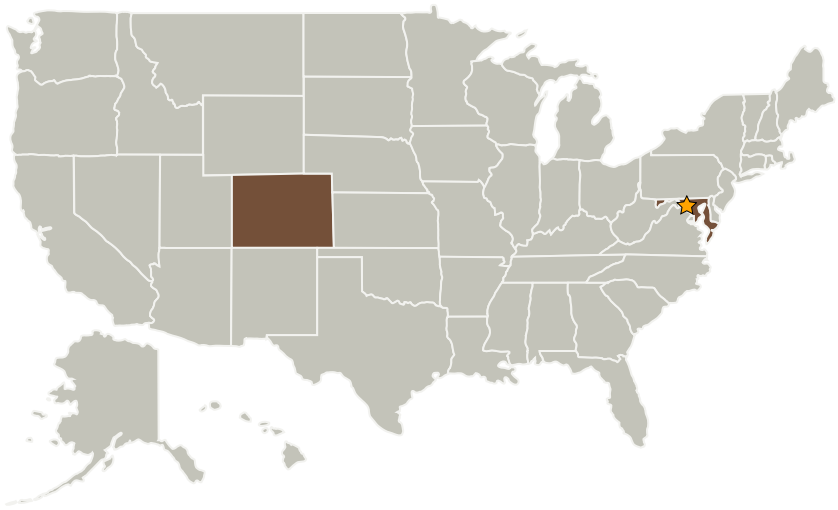
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
SPEC, Inc.	Supporting Organization	Industry	Boulder, Colorado

Primary U.S. Work Locations	
Colorado	Maryland

Project Transitions

January 2009: Project Start

July 2009: Closed out

Closeout Summary: Advanced Technology Cloud Particle Probe for UAS, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

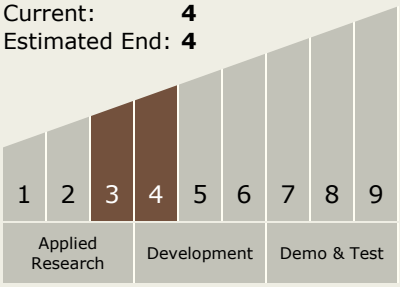
Carlos Torrez

Principal Investigator:

Ralph P Lawson

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Advanced Technology Cloud Particle Probe for UAS, Phase I

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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves